

ATTACHMENT E - Whole Effluent Toxicity (WET)

1. Summary memo on WET evaluation, limit development and incorporation in Permit.
2. WETLIM10 Spreadsheet indicating Acute & Chronic wasteload allocations – WLAc & WLAc
3. STATS.exe output file indicating a limit is required of 3.8 TU_c

M E M O R A N D U M
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
BLUE RIDGE REGIONAL OFFICE - Roanoke
Water Permits Division

3019 Peters Creek Road

Roanoke, VA 24019-2738

SUBJECT: WET Summary VPDES Permit VA0003646 2012 Reissuance MeadWestvaco
Outfall 003 wastewater treatment plant

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DATE: February 14, 2012

DISCUSSION:

Outfall 003 is the discharge from the wastewater treatment plant of MeadWestvaco's Covington, Virginia paper mill and carbon plant. A change in the paper mill's bleaching process was completed in 2001. Subsequently a series of recharacterization bioassays were performed that were the basis of the February 17, 2004 VPDES Permit modification. Following the review of the recharacterization data, the VPDES Permit as modified required annual chronic testing with *Pimephales promelas* and *Ceriodaphnia dubia*. There have been five bioassays since the VPDES Permit reissuance on February 12, 2007, eight tests since the 2004 modification and 21 since the method of pulp bleaching changed at the mill. Historically the treatment plant effluent has shown chronic sensitivity in reproduction in *C. dubia* (water fleas). A summary of bioassay results for both species is provided in **Attachment C** of the 2012 Fact Sheet.

Summary of C. Dubia WET Test Results (since January 2001 bleach plant change)

Test Date	NOEC %, Survival/ Repr or Grth	IC25 & TU _c	48-hour LC50	% Survival in 100% Effluent
1/30-2/6/01	100/57	74.8 & 1.8	>100	100
3/27-4/2/01	100/57	73.2 & 1.8	>100	100
6/19-26/01	100/57	79.0 & 1.8	>100	88
2/5-11/02	100/57.5	71.6 & 1.7	>100	89
3/5-11/02	100/43.5	54.4 & 2.3	>100	100
5/14-20/02	100/76	42.5 & 1.3	>100	80
6/4-10/02	100/76	71.9 & 1.3	>100	90
7/16-23/02	100/57.5	57.8 & 1.7	>100	100
8/27-9/2/02	100/43.5	55.2 & 2.3	>100	100
9/10-16/02	100/33	43.3 & 3.0	>100	100
10/1-7/02	100/76	81.8 & 1.3	>100	100
10/22-28/02	100/33	36.0 & 3.0	100	90
11/14-20/02	100/33	53.7 & 3.0	100	90
11/9-15/04	100/57.5	66.0 & 1.7	>100	100
10/4-11/05	100/33	32.6 & 3.0	>100	100
8/15-21/06	100/57.5	68.5 & 1.7	>100	95
9/25-10/1/07	100/33	47.6 & 3.0	>100	90
8/26-9/2/08	100/76	76.4 & 1.3	>100	100
9/1-9/7/09	100/33	41.6 & 3.0	>100	100
8/17-8/23/10	100/43.5	57.7 & 2.3	>100	100
8/11-8/17/11	100/33	33.8 & 3.0	>100	100

In accordance with the agency's Toxicity Management Program Implementation Guidance Memo #00-2012 a WET limit development (WETLIM10) Excel spreadsheet was prepared using updated receiving stream flows of 63.2 MGD, discharge rate of 35 MGD and a diffuser ratio of 2.9. The spreadsheet provides toxicity waste load allocations (WLAs) to use in a statistical reasonable potential evaluation of the need for a toxicity limit for the discharge.

The statistical limit evaluation software (STATS.exe) was used to determine if a WET limit was needed. Inputs were the WLA values from the WETLIM10 spreadsheet, chronic WLA 2.9 TU and acute WLA 8.7 TU, together with the 21 *C. dubia* reproduction TU values of the table above. The statistical evaluation includes a calculation of a coefficient of variation. The calculated value (0.354) indicates the degree of data variability that compares to the default coefficient of 0.6.

The statistical evaluation software determined that there is a reasonable potential for a toxicity violation from the treatment plant discharge. The limit is based on the chronic reproduction end-point of *C. dubia* (water flea). The software indicates a limit based of 3.8 TU_c is needed. To facilitate compliance monitoring dilutions the limit is rounded to a **TU_c less than or equal to 3.7** with a corresponding **NOEC greater than or equal to 27%.**

A recommended dilution series for compliance testing is: 100, 52, 27, 14, 7 and control.

When new toxic based limitations are included in a VPDES Permit the Permit Regulation allow for including a schedule of compliance before the limit takes effect. The VPDES Permit Regulation addresses Schedules of Compliance in 9 VAC 25-31-250 A including requirements for interim compliance dates when the schedule is greater than 1 year. All WET results since the change in the paper mill's pulp bleaching process have been below the new limit. The statistical variability of the toxicity results indicates the need (based on reasonable potential analysis) for the limit. MeadWestvaco has expressed concern that they may not be able to consistently comply with the limit. MeadWestvaco has several changes to boilers at the industrial plant either presently under construction or scheduled to begin construction shortly. These projects will reduce air pollution associated with the paper mill and activated carbon plant. The projects are anticipated to also reduce wastewater effluent toxicity. However, MeadWestvaco has also indicated in applications made to the DEQ Air Permitting program they are considering production increasing projects that may increase toxicity of the effluent. No specific schedule has been set for when increases in production of the mill may occur. Therefore, timing of potential impacts from increased production are not considered at this time but remain a possibility for the future. The boiler projects are expected to be complete at the end of 2013.

The reissuance will include a **3-year compliance schedule** for the WET limit with submittal of interim Progress Reports every **6 months**. The schedule will provide the facility time to complete construction of these projects, collect data to either demonstrate whether the WET limit is needed and request a permit modification or pursue additional measures after the completion of the current projects to satisfy themselves that they will consistently comply with the limit.

See Part I.B of the Permit for the Compliance Schedule condition and Part I.D for the WET condition. In accordance with the DEQ Toxicity Management Program wording the WET condition indicates 'The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters.' The permittee must demonstrate that pollutant specific limits correspond with the control of the effluent toxicity.

Should the permittee believe that changes at the facility have resulted in adequate improvement in effluent toxicity to warrant removal of the limitation, time must be allowed for the permit to be modified by DEQ before the limit becomes effective. A Plan to 'recharacterize' the effluent should be submitted to the Regional Office and approved prior to pursuing the Plan. The Plan should include a schedule, dilution series and indicate that testing will use both species with acute and chronic endpoints.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Spreadsheet for determination of WET test endpoints or WET limits															
2																
3																
4	Excel 97															
5	Revision Date: 01/10/05															
6	File: WETLIM10.xls															
7	(MIX.EXE required also)															
8																
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14																
15	Enter data in the cells with blue type:															
16																
17	Entry Date:		03/12/12													
18	Facility Name:															
19	VPDES Number:		VA0003646													
20	Outfall Number:		003													
21																
22	Plant Flow:		35 MGD													
23	Acute 1Q10:		63.2 MGD													
24	Chronic 7Q10:		63.2 MGD													
25																
26	Are data available to calculate CV? (Y/N)		Y		(Minimum of 10 data points, same species, needed)										Go to Page 2	
27	Are data available to calculate ACR? (Y/N)		N		(NOEC<LC50, do not use greater/less than data)										Go to Page 3	
28																
29																
30	IWC _a		34.48275862 %		Plant flow/plant flow + 1Q10		NOTE: If the IWC _a is >33%, specify the NOAEC = 100% test/endpoint for use									
31	IWC _c		34.48275862 %		Plant flow/plant flow + 7Q10											
32																
33	Dilution, acute		2.9		100/IWC _a											
34	Dilution, chronic		2.9		100/IWC _c											
35																
36	WLA _a		0.87		Instream criterion (0.3 TUA) X's Dilution, acute											
37	WLA _c		2.9		Instream criterion (1.0 TUC) X's Dilution, chronic											
38	WLA _{a,c}		8.7		ACR X's WLA _a - converts acute WLA to chronic units											
39																
40	ACR -acute/chronic ratio		10		LC50/NOEC (Default is 10 - if data are available, use tables Page 3)											
41	CV-Coefficient of variation		0.298277432		Default of 0.6 - if data are available, use tables Page 2)											
42	Constants eA		0.602581536		Default = 0.41											
43	eB		0.76491602		Default = 0.60											
44	eC		1.659526453		Default = 2.43											
45	eD		1.659526453		Default = 2.43 (1 samp)											
46																
47	LTA _{a,c}		5.242459367		WLA _{a,c} X's eA		*The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTA _{a,c} and MDL using it are driven by the ACR.									
48	LTA _c		2.218256459		WLA _c X's eB											
49	MDL** with LTA _{a,c}		8.7		TUC		NOEC =		11.494253		(Protects from acute/chronic toxicity)		Rounded NOEC's		%	
50	MDL** with LTA _c		3.681255273		TUC		NOEC =		27.164647		(Protects from chronic toxicity)		NOEC =		28 %	
51	AML with lowest LTA		3.681255273		TUC		NOEC =		27.164647		Lowest LTA X's eD		NOEC =		28	
52																
53	IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TUC to TUA															
54																
55	MDL with LTA _{a,c}		0.87		TUA		LC50 =		114.942529		%		Use NOAEC=100%		Rounded LC50's	
56	MDL with LTA _c		0.368125527		TUA		LC50 =		271.646470		%		Use NOAEC=100%		LC50 = NA	
57																
58																

[illegible]

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
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Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC₅₀, since the ACR divides the LC₅₀ by the NOEC. LC₅₀'s >100% should not be used.

Set #	LC ₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Set #	LC ₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Monitoring	Limit		
% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean	66.1	1.512792	
Dilution series to use for limit		28	3.5714286
Dilution factor to recommend:	0.8130371	0.5291503	
Dilution series to recommend:	100.0	1.00	1.00
	81.3	1.23	1.89
	66.1	1.51	3.57
	53.7	1.86	6.75
	43.70	2.29	12.76
Extra dilutions if needed	35.53	2.81	24.10
	28.88	3.46	45.55

Enter LC ₅₀	TUc	Enter NOEC	TUc
1	NO DATA	57	1.754386
2	NO DATA	57	1.754386
3	NO DATA	57	1.754386
4	NO DATA	57.5	1.739130
5	NO DATA	43.5	2.298851
6	NO DATA	76	1.315789
7	NO DATA	76	1.315789
8	NO DATA	57.5	1.739130
9	NO DATA	43.5	2.298851
10	NO DATA	33	3.030303
11	NO DATA	76	1.315789
12	NO DATA	33	3.030303
13	NO DATA	33	3.030303
14	NO DATA	57.5	1.739130
15	NO DATA	33	3.030303
16	NO DATA	57.5	1.739130
17	NO DATA	33	3.030303
18	NO DATA	76	1.315789
19	NO DATA	33	3.030303
20	NO DATA	43.5	2.298851

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here:

NO DATA %LC₅₀

NO DATA TUa

MeadWestvaco Covington

Chemical = **Whole Effluent Toxicity** (C. dubia chronic reproduction data – 21 results)

Chronic averaging period = 4

WLAa = 8.7

WLAc = 2.9

Q.L. = 0.1

samples/mo. = 1

samples/wk. = 1

Summary of Statistics:

observations = 21

Expected Value = 2.22890

Variance = .624816

C.V. = 0.354637

97th percentile daily values = 4.01362

97th percentile 4 day average = 3.05564

97th percentile 30 day average = 2.50036

< Q.L. = 0

Model used = lognormal

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = **3.80918741141639**

Average Monthly limit = **3.80918741141639**

The data are: 1.8, 1.8, 1.8, 1.7, 2.3, 1.3, 1.3, 1.7, 2.3, 3, 1.3, 3, 3, 1.7, 3, 1.7, 3, 1.3, 3, 2.3 & 3